

*REMARKS/ARGUMENTS*

In response to the Office Action mailed May 2, 2006, Applicants amend their application and request reconsideration. In this Amendment, all claims presented for examination are canceled and those claims are replaced by new claims 11-22.

Accordingly, claims 11-22 are now pending.

The new independent method claims 11 and 14 replace original claim 1. Claims 11 and 14 derive from original claim 1. In addition, claim 14 is supported by the description of the Fifth Embodiment described at pages 26-28 of the patent application. New claims 12 and 15 are derived from original claim 2. New claims 13 and 16 are derived from original claim 6. Likewise, new apparatus claims 17-20, respectively, are derived from and replace original claims 4-7. Claims 21 and 22 lack counterparts in the originally examined claims but are supported by the application as filed.

Applicants bring to the Examiner's attention co-pending patent application No. 10/529,373 filed March 28, 2005 and being examined by Examiner Coleman in Group 2823. Claims of that patent application, which cannot be statutory prior art to the present patent application, were rejected for obviousness type double patenting over claim 1 of the present patent application. A Response to that rejection is being filed simultaneously with this Response.

An important feature of the invention that is well described in the patent application, but may have not appeared clearly in the examined claims, relates to the irradiation of two overlapping areas on a silicon film with pulsed visible laser light and pulsed ultraviolet laser light. While there are numerous explanations of several embodiments of the invention in the patent application, this illumination arrangement is particularly clearly shown in Figure 8. As shown in the that figure, a lens 21 focuses both pulsed visible laser light producing a pattern 35 and pulsed ultraviolet laser light producing a pattern 36. As illustrated in this figure, an amorphous silicon substrate moves, relative to the illumination, in a direction along arrow 71, transverse to, i.e., nearly or essentially perpendicular to, the linear shape of the two patterns 35

and 36. These patterns are substantially the same size and only partially overlap. The visible light pattern leads the ultraviolet light pattern. After passage of the illumination by both pulsed visible laser light and pulsed ultraviolet laser light where the patterns overlap, pulsed ultraviolet light is applied where the pattern 36 trails the pattern 35. As explained in the patent application, particularly because of the absorption characteristics of amorphous silicon and polycrystalline silicon with respect to wavelengths of incident light, the applied pattern of light is particularly useful in fusion and recrystallization of an amorphous silicon film into a polycrystalline silicon film.

As described in the patent application at several locations and illustrated with respect to Figure 6, for example, a laser produces pulsed laser light in the visible spectrum. A wavelength converter, namely a harmonic generator 10, in that embodiment, converts part, but only part, of the pulsed visible light into pulsed ultraviolet laser light. As explained in the patent application, although the two beams of light at substantially different wavelengths, beams 2 and 6, are shown as offset in Figure 6 for clarity, the beams are, in fact, coaxial. The beams are shaped into the linear patterns by an optical system, for example, including elements 13 and 80 in Figure 6, and generally focused on the surface of an amorphous silicon film 9 shown in that Figure 6. The focusing system embodiment illustration includes prisms 80 that ensure that the pattern of visible light is offset from the pattern of ultraviolet light so that the two patterns are only partially overlapping. As explained in the patent application, because of chromatic aberration, the two light beams cannot usually be simultaneously exactly focused on the surface of the amorphous silicon film 9, but are generally focused on the surface of that film.

In Figure 6, the arrow 71 illustrates the direction of relative movement of a substrate supporting the amorphous silicon film 9 with respect to the illumination. The film is scanned with the pulsed visible and ultraviolet laser light patterns and recrystallized. As well known in the art, the pattern can shift direction and step and repeat over the surface of a relatively large amorphous silicon film. See, for example, Figure 14 of the patent application and the accompanying description. The foregoing

discussion is not intended to limit the scope of the claims, but rather to describe where in the patent application support for the clarified claims that are now presented can be found.

While it is understood how the claims presented for examination were rejected, the rejections cannot be maintained as to any claim now pending.

Claims 1, 2, 4, 5, and 8-10 were rejected as anticipated by Abe (U.S. Patent 6,825,069). This rejection is respectfully traversed as to all claims now pending.

In citing Abe, the Examiner directed attention to passages appearing in columns 5 and 6 of that patent. That patent describes applying, in succession, a series of laser beams, as many as three such laser beams, to an amorphous film to produce a polycrystalline silicon film. The preferred laser beam is ultraviolet light, for example produced by an excimer laser. Contrary to the assertion of the Official Action, there is no description in the cited passages of Abe of using visible light in the crystallization process. There is only reference to using wavelengths adjacent to the ultraviolet band and the specific wavelengths mentioned are not visible light wavelengths.

Most importantly, there is no description in Abe of applying partially overlapping patterns of visible light and ultraviolet light as in the claimed invention. Therefore, Abe cannot anticipate the method of claims 11 and 14 or any of their dependent claims 12, 13, 15 and 16.

The claims directed to an apparatus, claims 17-20, are likewise not anticipated by Abe. Abe describes using harmonics of light produced by an YAG laser, but never describes using visible light produced by such a laser, either alone or in combination with ultraviolet light produced by harmonic conversion. The Abe apparatus cannot produce the two partially overlapping patterns of visible and ultraviolet light on the film being crystallized. Therefore, Abe cannot describe the apparatus of claims 17-20. Further, there is clearly no apparatus including prisms as in original claim 7 or new claim 20. (Claim 7 was not rejected as anticipated by Abe).

Claims 3, 6, and 7 were rejected as unpatentable over Abe in view of Yamazaki (U.S. Patent 6,770,546). This rejection is also traversed as to the claims now presented.

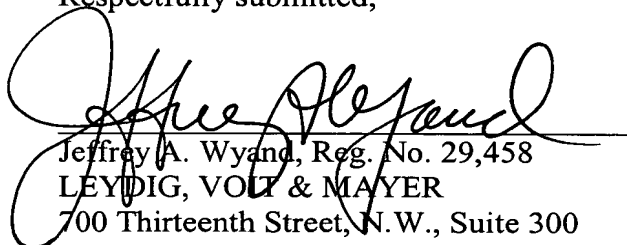
The essential error in the rejection is that Yamazaki, like Abe, never describes applying partially overlapping patterns of visible and ultraviolet light, produced from the same light source and generally focused on the surface of the film being crystallized.

The passage of Yamazaki relied upon and appearing in column 4 of that patent describes the use of a YAG laser as a source of visible light for recrystallizing an amorphous silicon film. However, the same passage also states that for crystallization to occur, it is preferred to use the second to fourth harmonic of the visible light which, as known to those of skill in the art, clearly falls within the ultraviolet range of the light spectrum. The specific examples of wavelengths provided by Yamazaki are a wavelength in the ultraviolet range and a wavelength for a YVO<sub>4</sub> laser that is within the visible spectrum.

Notwithstanding these references, there is no description in Yamazaki for irradiation of two overlapping areas on an amorphous film with visible light and ultraviolet light to produce the advantageous results of crystallization described in the patent application. Accordingly, no combination of the Abe and Yamazaki patents can suggest the claimed invention.

Reconsideration and allowance of the claims now presented for examination are earnestly solicited.

Respectfully submitted,

  
Jeffrey A. Wyand, Reg. No. 29,458  
LEYDIG, VOLT & MAYER  
700 Thirteenth Street, N.W., Suite 300  
Washington, DC 20005-3960  
(202) 737-6770 (telephone)  
(202) 737-6776 (facsimile)

Date: August 21, 2006